TABLE VII .- Heights of rivers referred to zeros of gages .- Continued.

Stations.	nce to th of sr.	iger line i gage.	Higher	st water.	Lowe	st water.	stage.	nthly ange.	Stations.	istance to mouth of river.	ger line n gage.	Highest water.		Lowest water.		1 to	thly ige.
	Distance mouth river.	Dang on a	Height.	Date	Height.	Date.	Mean	Mon		Dista mo	Dang	Height.	Date.	Height.	Date.	Меап	M o n ran
Neches River-Cont'd.	Miles.	Feet.	Feet.		Feet.		Feet	Feet.	Colorado River-Cont'd,	Miles.	Feet.	Feet.		Feet.		Feet.	Feet
Beaumont, Tex		10	2.4	30	-0.1	14	1.1	2. 5	Columbus, Tex	100	24	6.9	28	5. 4	\$9, 15, 16, } 20-25	5. 6	1.
Dallas, Tex	100	25 40 25	27. 2 9. 9 10. 8	27 31	1.8 0.9 4.5	10–12 17, 19 14, 15	7. 7 2. 7 6. 0	25, 4 9, 0 6, 3	Red River of the North. Moorhead, Minn. 8 Columbia River	418	26	10.9	31	8. 7	22, 23		2.
Brasos River. Kopperl, Tex	869	21	2.6	27-29	-1.5	25	-0. 2	4.1	Umatilla, Oreg The Dalles, Oreg	270 166	25 40	9. 7 15. 7	11 11	3, 5 6, 0	5 5	6. 1 9. 9	6. 9.
Waco, Tex	301 215	24 40 39	5. 1 1. 7 3. 5	29 31 1-3	$ \begin{array}{c c} 2.0 \\ -1.7 \\ 1.6 \end{array} $	14 19–28 28–31	2. 5 -1. 1 2. 5	3. 1 3. 4 1. 9	Willamette River. Albany, Oreg Portland, Oreg	118	20 15	21. 0 15, 5	10 11	9. 5 7. 7	27, 28 28	13. 4 11. 6	11. 7.
Colorado River. Ballinger, Tex Austin, Tex		21 18	1. 2 2. 0	1, 2, 17 23		3-16,18-31 15,16	1. 0 1. 3	0. 2 1. 0	Sacramento River. Red Bluff, Cal Sacramento, Cal	265 64	23 25	26. 3 26. 3	10 22	10. 4 21. 8	27 10	17. 8 24. 2	15. 4.

¹Frozen for 28 days. ²Frozen entire month. ³Frozen for 24 days. ⁴Frozen for 22 days. ⁵Frozen for 8 days. ⁶I6 days only. ⁷I7 days only. ⁸Frozen for 21 days. ¹⁰Frozen for 18 days. ¹¹Frozen for 4 days. ¹²Frozen for 26 days. ¹³Frozen for 23 days. ¹⁴29 days only. ¹⁵Gage broken. ¹⁶Frozen for 3 days.

HAWAIIAN CLIMATOLOGICAL DATA.

By R. C. LYDECKER, Territorial Meteorologist. Rainfall data for March, 1904.

Stations.	Elevation	Amount.	Stations.	Elevation	Amount.
HAWAII.			MAUI-Continued.	Feet.	Inches
HILO, e. and ne.	Feet.	Inches.	Paia	180	8.9
Vaiakea	50	0.90	Haleakala Ranch	2,000	9. 2
lilo (town)			Wailuku. ne	250	11. 3
	85	2. 27	Wailuku, ne		
gumana	1,250	0.72	Keomuku	10	6. 7
epeekeo	100	1, 38	OAHU.		
epeekeo akalau	200	3. 22	Punahou (W. B.), sw Kulaokahua (Castle), sw	47	7.3
		3.80	Kulaokahua (Castie), sw	50	6. 2
uuohua	1,050	5.83	Makiki Reservoir U. S. Naval Station, sw	120	4. 3
aupahoehoe	500	10.85	U. S. Naval Station, sw	6	6. 5
okala	400		Kapiolani Park, sw	10	5. 4
HAMAKUA, 116.	250	2, 97	College Hills	175 285	6.6
ukaiauaauilo	300	2.07	Manoa (Phodes Gardons)	360	6. 9 8. 0
	200	2.07	Income Aculum	30	6.9
Ionokaa (Mill)	425	4, 47	School street (Bishop), sw) "	0
Ionokas (Meinicke)	1. 100	5, 86			
ukuihaele	700	4. 14	Kalihi-Uka sw	485	
KOHALA, n.			Nuuanu (W. W. Hall), sw	50	6. 0
wini Ranch	1,100	8. 78	Kalihi-Uka, sw. Nuuanu (W. W. Hall), sw. Nuuanu (Wyllie street). Nuuanu (Elec. Station), sw. Nuuanu (Luakaha), c.	250	6. 8
lalawa	450		Nuuanu (Elec. Station), sw	405	6, 6
fiulii	200	3. 16	Nuuanu (Luakaha), c	850	11.0
ohala (Mission)	521	4.14	U. S. Experiment Station	350	7.5
ohala (Sugar Co.)	270	2, 96	Kaliula	1,150	
	700	4. 47	Laniakea (Nahuina)		
	600	4.18	Laniakea (Nahuina) Tantalus Heights (Frear)	1,360	5. 9
uuhue Ranch	1,847	5. 16	Waimanalo, ne	20	16. 3
aimea	2, 720	3.60	Maunawill, ne	300	19.
KONA, W.	2 000	8.00	Kaneohe	100 350	14.
folgolog	1 950	8.40	Kahuku n	25	19. 3 9. 3
Iolualoa	3 500	0.40	Kahuku, n'	20	9.
einelin	1 470		Wahiawa	900	15.
ainaliu ealakekua	1,580	6, 23	Ewa Plantation. s	60	6.
apoopoo	25	4. 63	Ewa Plantation, s		
apoopoo	1,650	6. 11	Waipahu	200	7.
Ioopuloa	2, 300	5, 92	Moanalua	15	7.
Ioopuloa	2,700	6. 30	Pacific Heights		
Iuehue			KAUAI.	l	
KAU, se.			Lihue (Grove Farm), e	200	10.
ahuku Ranch	1,680		Lihue (Molokoa), e	300	10.
Ionuapo	15 650	4. 44 5. 61	Lihue (Kukaua), e Lihue (Kilohana)	400	11.
lilea	310	4.40	Kealia, e	15	
ahala	850	4, 69	Kilauea (Plantation), ne	325	17.
Ioaula		7.00	Hanalei, n	10	17.
olcano House	4 000	4, 47	Waioli		
PUNA. e.	-, 000		Haena		
PUNA, e. laa, Mountain View (Russel)	1,530		Waiawa	32	6.
laa Plantation (Mill)	210		Eleele	150	4.
apoho	110	2.43	Wahiawa (Mountain)		
ahoa	600	3. 13	McBryde (Residence)	850	5. 8
MAUI.			Lawai (Gov. Road)	450	7.
ahaina			Lawai, w	225	4. 1
Vaiopae Ranch	700	9.80	Lawai, e	800	5.
aupo (Mokulau), s	285 308	9. 48 9. 19	Koloa	100	6. 3
Lipahulu, s	908	9. 19	Lawai Beach		
lana	900	9. 88	Pahala	i .	15.
aniku, neahiku		13, 00	Hawi Mill		13.
laiku n	700	8. 90	Ookala		10.
	4 500	9.68	U. S. Magnetic Station		25.
ula (Erchwon) n					
laiku, n ula (Erehwon), n ula (Waiakoa), n	$\frac{4,000}{2,700}$	10.65	Honokaa		16.

Note.—The letters n, s, e, w, and c show the exposure of the station relative to the winds. GENERAL SUMMARY FOR MARCH, 1904.

The record for the month, as a whole, was unique in the annals of the Weather Bureau. Light southerly winds and

Meteorological Observations at Honolulu, March, 1904.

The station is at 21° 18' north, 157° 50' west. It is the Hawaiian Weathers the Funahou. (See fig. 2, No. 1, in the Monthly Weather Review for July, 1902, page 365.) Hawaiian standard time is 10° 30° slow of Greenwich time. Honolulu local mean time is 10° 31° slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other. Rainfall for twenty-four hours is measured at 9 a. m. local, or 7:31 p. m., Green wich time. The rain gage, 3 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

Date		e.	Tem	pera-	Duri	ng tw	enty- time,	four l or 2:	nours prec 30 a. m. H	eding onolu	1 p. n lu tin	u. Greei ie.	wich	a. m.,
1	Dota	sea lev					Means.		Wind.		ondi-			ll at 9 s time.
2. 29, 90	Date.	Pressure at	Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.	96	Maximum.	Minimum.	Total rainfa
Departure. —, 089	2 3 4 4 5 5 6 6 7 7 8 8 9 9 10 11 12 13 14 15 16 17 18 19 20 21 22 22 25 26 28 29 30 31 Sums Means Depar-	29, 92 20, 95 20, 95 20, 90 229, 96 30, 016 29, 92 29, 96 30, 02 29, 88 29, 84 29, 84 29, 84 29, 84 29, 88 20, 93 30, 00 29, 89 29, 90 29, 88 29, 91 29, 92 29, 93 29, 94 29, 910	68 73 73 71 70 70 68 66 66 65 67 70 68 66 65 67 70 68 66 67 70 68 66 66 67 67 68 68 66 66 66 66 66 66 66 66 66 66 66	65. 5 65. 70 70 70 70 67 69. 65. 5 66. 5 67. 5 66. 68. 5 71 71. 5 67 67 69. 69. 60 60 60 60 60 60 60 60 60 60 60 60 60	77 75 79 77 78 79 78 80 80 74 76 76 77 78 79 79 79 79 77 74 77 74 77 74 77 74 77 74 74 74 74	65 67 66 66 67 67 67 68 66 66 66 66 66 67 67 67 68 68 68 68 68 68 68 68 68 68 68 68 68	66, 55, 56, 68, 56, 68, 57, 69, 69, 69, 69, 69, 69, 69, 69, 69, 69	78 89 88 89 88 89 88 89 88 89 88 89 88 89 88 89 88 89 89	W-SW, HDE, SW, SW, SW, SS, SS, SS, SS, SS, SS, SS	0 0 -1 1 -0 0 0 0 1 -0 1 -0 0 0 1 -0 0 0 1 -0 0 0 0	\$ 10 8-5 10-5 8-5 10-8 8-5-7 5-7 5-10-3 10-7 10-3 10-7 4-10 5-0 5-0 4 0-7 7-10 6.7	29, 95 29, 90 29, 95 29, 99 30, 04 30, 03 329, 98 30, 00 29, 99 29, 91 29, 98 29, 91 29, 98 30, 05 30, 05 30, 05 30, 05 30, 06 30, 06 30, 06	29, 79 29, 80 29, 81 29, 83 29, 95 29, 90 29, 91 22, 90 20, 83 29, 81 29, 83 29, 81 29, 83 29, 81 29, 83 29, 83 29, 83 29, 83 29, 85 29, 85 29, 85 29, 85 29, 85 29, 85 29, 85 29, 85 29, 85 20, 85 20	0, 55 0, 18 0, 28 0, 40 T

Mean temperature for the month of March, 1904, $(6+2+9)+3=71.2^\circ$; normal is 70.7°. Mean pressure for the month of March, 1904, (9+3)+2=29.921; normal is 30.010. *This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. †These values are the means of (6+9+2+9)+4. § Beaufort scale. \parallel +11.8. Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

calms predominated, while the trades were conspicuous by their absence, and though there were light airs from that quarter during a portion of six days, they could by no means be designated as trade winds. The consecutive number of days of southerly winds was the greatest on record, while the wind force was the lightest, probably the lightest known here, the

average for the month being but 0.26, Beaufort scale. As shown by the records of this office the average force of the March winds is 3.2.

The mean pressure for the month, 29.921, was .089 below the normal, a departure only exceeded once before (February, 1902.—.121) in the history of the Weather Bureau.

The rainfall was considerably in excess of the normal on all the islands with the exception of Hawaii, where, with the exception of the Kona district, the precipitation was much less than normal. This was also the case at the stations in the Honolulu and Nuuanu districts on Oahu above the 100-foot elevation. In these districts the heavy rains fell at the stations below this altitude, while at the stations above the downfall was less than normal.

As a result of the conditions above mentioned the relative humidity, dew-point, and cloudiness were all greatly in excess of their respective normals.

The artesian well water showed the effects of the heavy rains of February, and rose to 35.85 feet above mean sea level. These are the highest figures reached since this series of observations was taken up in March, 1899, and the end of April will doubtless show a much higher level. When the level of this water was first ascertained in 1882, it stood at 42 feet above mean sea level.

Honolulu.—Temperature mean for the month, 71.2°; normal, 70.7°; average daily maximum, 77.0°; average daily minimum, 66.2°; mean daily range, 10.8°; greatest daily range, 18° (25th); least daily range, 5° (5th); highest temperature, 80° (9th, 10th, and 30th); lowest temperature, 57° (25th).

Barometer average, 29.921; normal, 30.010; highest, 30.06 (29th); lowest, 29.78 (15th and 16th); greatest 24-hour change, that is from any given hour of one day to the same hour on the next, .10 (3 p. m. 18th to 3 p. m. 19th); lows passed this point 1st to 4th, 12th to 18th, and 24th to 27th, inclusive; highs, 19th, 20th, and 29th.

Relative humidity average, 83.5 per cent; normal, 71.7 per cent; mean dew-point, 65.7°; normal, 61.5°; mean absolute moisture, 6.96 grains per cubic foot; normal, 6.05 grains.

Rainfall, 7.30 inches; normal, 3.76 inches; greatest rainfall in twenty-four hours 1.41 inches (14th); rain record days, 22; normal, 18.

The artesian well water level rose from 34.80 to 35.85 feet above mean sea level. March 31, 1903, it stood at 34.85. The average daily mean sea level for the month was 9.77, the assumed annual mean being 10 feet above datum. For March 1903, it was 9.59.

Trade wind days, none; normal, 18; average force of wind, Beaufort scale and during daylight only, 0.26; average cloudiness, tenths of sky, 6.7; normal, 4.6.

Approximate percentages of district rainfall as compared with normal: Hawaii, Hilo district, 12 per cent; Hamakua, 37; Kohala, 56; Waimea, 70; Kona, 162; Kau, 90; Puna, 27; island of Maui, 198; Oahu, Honolulu district, below 100 feet elevation, 189; above, 55; Nuuanu, below 100 feet elevation, 181; above, 82; Koolau, 254; Ewa, 356; Kauai, Lihue district, 228; Hanalei, 167; Waimea, 276.

The heaviest monthly rainfall was at Maunawili, Oahu, 19.97 inches. The heaviest 24-hour rainfalls were at Awini Ranch, Hawaii, 5.46 inches, 23d and Kipahulu, Maui, 4.43, same date.

Temperature table for March, 1904.

Stations.	Eleva- tion.	Mean max.	Mean min.	Cor. av'ge.	High- est,	Low- est.
	Feet.	0	0	0	3	0
Hilo	40	84.2	64.9	73.9	89	62
Pepeekeo	100	78.8	67. 7	72.6	83	66
Olâa Mill	210				<i></i>	
Kohala	521	80.0	67. 1	72. 9	86	63
Waimea	2,730	74. 9	57. 2	65. 4	80	52
Volcano House	4,000	<i></i>		 .	<i>.</i>	
Waiakoa	2,700	74.5	58.1	65. 6	81	50
Keomuku	10	79.0	71.5	75. 1	85	66
Kinau	50	76.7	66. 0	70.6	80	56
Ewa Plantation	60	76.3	63. 7	69, 3	80	δ4
United States Experiment Station	350	78.1	66. 5	71, 7	82	59

Kohala, dew-point, 65.0°; relative humidity, 77.9 per cent. Ewa Mill, dew-point, 63.0°; relative humidity, 79.0 per cent; barometer average, 29.88.

Honolulu—Dew ten mornings; lightning to southward on the evenings of the 12th and 15th; electric storms, 17th and 19th; thunder, 29th at 8:45 a.m.

Reported from other stations: Hawaii, Kapoho, southerly winds all the month. Pepeekeo, large meteor March 8, at 11:45 p. m., moving from west to east; more or less snow on mountains all the month; very dry and streams running low; thunder 14th and lightning 15th; 18th, distant lightning all night; thunder 28th; large halo round the sun 21st at 12m., and 29th at 11 a. m.; dew nine mornings; heavy surf 23d and 26th; wind force, 2.4; cloudiness, 5.7. Kohala, earthquake 29th at 11:45 a. m., and 30th at 12:15 p. m. Waimea, earthquake 29th; calms and light westerly winds predominated. Hilo, clear weather throughout the month excepting the 24th and 25th.